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The relationship between reading ability and recognition of four kinds of perceptual stimuli for purposes of reading disability diagnosis was investigated. The sample consisted of 84 male grade-3 pupils who were matched on intellectual ability but who differed in reading proficiency. Three groups, based on a 6-month discrepancy either above or below grade placement between reading achievement and potential as determined by the Bond-Tinker formula, were formed. Recognition tasks were presented by tachistoscope. The four perceptual categories were (1) geometric or abstract configuration, (2) pictorial design, (3) alphabetic symbol, and (4) word unit. Geometric forms, alphabetic symbols, and word units were found to significantly differentiate (.01) between able and disabled readers. Alphabetic symbols appeared to be a slightly higher predictor than the other two forms. Implications were that present readiness materials stressing discrimination of pictorial and abstract forms are less effective in predicting reading proficiency than are forms actually involved in the reading act, namely letters and word units. (WB)

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INVESTIGATION OF RECOGNITION VARIANCE OF PERCEPTUAL STIMULI ASSOCIATED WITH READING PROFICIENCY

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This study investigated the relationship between reading ability and recognition of four kinds of perceptual stimuli for purposes of more accurate prediction and diagnosis of reading disability. Specifically, it sought to determine which targets were more readily recognized by able than disabled readers and the effect of stimuli duration on the recognition task. Accurate assessment of these differences seemed imperative in developing more effective diagnostic, remedial, and preventive educational programs in the field of reading.

The research hypotheses tested were, first of all, that reading ability would affect discrimination skill and would be in direct relation to the measured reading achievement of the three groups. In other words, high level readers would do better on the four recognition tasks than would their less able reading classmates. Secondly, duration exposure was considered as a variable affecting recognition on all four categories of perception and was hypothesized as operating to deter recognition in the opposite direction of reading ability. Thirdly, it was postulated that the quality of meaningfulness of the perceptual item would affect performance--being most valuable as a recognition cue for able readers and of least value in determining recognition for disabled readers. Meaningfulness in this study was defined as including such aspects as the familiarity of form and/or frequency of exposure, the pronunciability or translation of the graphic configuration to a linguistic form, and the number of associations elicited by the stimuli as a result of past experience. Fourth, it was hypothesized that the perceptual category of word-units would be more discriminative of reading ability than would other forms.

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The sample consisted of eighty-four male third-grade pupils who were matched according to grade, sex, and intellectual ability but who differed in reading proficiency. (The mean Intelligence Quotient for each group was 101). Three reading groups were formed, based on a six-month discrepancy either above or below grade placement between reading achievement and reading potential--the latter being determined by use of the Bond and Tinker formula for reading expectancy. Group achievement and intelligence tests were used to determine these differences. All subjects were then randomly assigned to one ordering of the four perceptual tasks and exposure durations.

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The recognition task was based on tachistoscopic presentation of forty targets, ten each in the four perceptual categories of geometric or abstract configurations, pictorial design, alphabetic symbol, and word-unit. The four exposure spans selected ranged from 1/2 to 1/25 second--the shortest being considered within the recognition threshold for primary age children. To eliminate the effect of presenting a given subtest in one particular order or at only one duration span, the data were placed in a Latin Square design prior to assignment of subjects. In this way, as the order of the perceptual categories rotated, each type of form received a different exposure which allowed for more intensive examination of recognition differences accrued by brevity of exposure. The subject's response on each subtest was totaled separately as a means of determining differences in response to targets defined as meaningful (Word-Units and Pictorial Design) versus nonmeaningful (Geometric Forms and Alphabetic Symbol), as well as variance resulting from duration changes.

Four two-way analyses of variance were used to assess the effect of reading ability and duration exposure upon the four recognition tasks. Results indicated that reading ability significantly ($p < .05$) affected performance on all recognition tasks with the exception of Pictorial Design. Although Low Level readers were less facile in recognizing these forms than the other reading groups, the results failed to reach an acceptable level of significance which arbitrarily had been selected at .05 level of confidence. Secondly, it was confirmed that duration exposure produced significant variance ($p < .05$) between the response of the three reading groups on all targets with the exception of geometric forms. In this instance, although disabled readers were more affected by brevity of exposure than the other two reading groups, they apparently did not benefit greatly from more lengthy exposure in being able to correctly recognize the form. Since no significant interactions between reading ability and duration exposure were found to exist, it was accepted that both duration exposure and reading achievement operate as significant variables affecting performance on recognition tasks.

Examination of mean scores between able and disabled readers failed to indicate any significant difference in performance between the two groups as a result of the meaningful quality of the target. In fact, if meaning were a factor, it operated to increase the performance of the disabled reader as noted by a slightly higher mean on the word-unit subtest than on the geometric tasks. Similarly, no particular increment in performance was gleaned by lack of linguistic associations on

the part of Low Level Readers as indicated by greater difficulty in handling alphabetic symbols, than any other form. Therefore, the results rejected the assumption that a negative correlation exists between reading ability and recognition of meaningful targets.

There appeared to be then, three subtests which were found to significantly differentiate ($p=<.01$) between able and disabled readers. These were the subtests of geometric forms, alphabetic symbols, and word-units. Although there was a slightly higher correlation between alphabetic symbol subtest and reading proficiency, it was not significantly greater than the correlations derived on the other two targets and, thus, all three forms could be used with equal success in the prediction of potential reading difficulty.

The results of the investigation provide for a number of comments and cautions. First, the finding that alphabetic symbols, word-units, and geometric forms are relatively good predictors of reading achievement at the third grade level supports the work of Ashlock, King, Goins, and others. That alphabetic symbols appeared to be a slightly higher predictor of reading achievement than either of the other two forms may be attributed to the necessity of attending to details within the grouping rather than to the general configuration. On targets involving geometric form and word-units, disabled readers appeared to attend to the general configuration, selecting those forms most similar in shape to that of the target. This procedure was not possible in recognizing letter trigrams since all choices involved a similar configuration and were of the same length and shape as the target. The need to attend to the details within a given trigram may explain the greater difference in the performance of able versus disabled readers on the Alphabetic Symbol subtest. Similarly, the significantly better performance of able versus disabled readers on word-units and geometric forms may be attributted to a tendency of good readers to focus on the critical properties of a form as a means of later identification whereas poor readers tend to utilize a more global approach to perception. That differences exist in recognition style between good and poor readers can only be inferred from inspection of response trends and warrants further investigation before being accepted.

Secondly, the magnitude of the correlation coefficients found does not permit precise prediction of reading achievement on the basis of only the results from the four recognition tasks. Although the data indicate that recognition of the three

targets is a better determiner of reading ability than would be made on the basis of chance predictions, the information must be supplemented with teacher observation and judgement about the child's performance in other skill areas related to reading in order to best determine a child's overall preparedness and eventual success in reading.

Thirdly, the tasks studied, with the exception of pictorial design, appeared to have predictive and diagnostic implications which warrant further study both individually and in combination. Subjects selected as being deficient in reading skills consistently performed less effectively on all discrimination tasks than did subjects selected as demonstrating more adequate reading skills. The correlation between reading ability and the selected tasks, however, did not denote a strong relationship between the two variables. In other words, at the third grade level, visual discrimination skills account for only a small segment of the skills necessary for reading achievement. That disabled readers continued to demonstrate ineffective recognition skills at this level of development may suggest, however, that those youngsters exhibiting perceptual difficulties during the early period of schooling and who later are unable to compensate for these deficiencies, may experience greater difficulty in acquiring reading skills than would normally be incurred. As a result, perceptual inadequacies may be a stronger determiner of reading proficiency for these youngsters than the correlations denote.

In summary, the study stimulates further questions on theories of learning to read. Important among these questions are the stimulus characteristics of words with relation to their discriminability and the recognition response patterns unique to able versus disabled readers. In recognizing words and letter groupings in isolation, the findings suggest that disabled readers attend more to the general configuration of the form whereas able readers attend to details within the configuration such as ascending/descending letter patterns. Accordingly, certain words when presented together may be more difficult for both good and poor readers to recognize than other word pairs. For example, it may be more difficult to differentiate between look/took than between car/cattle for both groups of readers. Furthermore, the effect of meaningful associations on the recognition task and the differences, if any, in the utilization of meaning as a cue to word identification (both in context and in isolation) on the part of able versus disabled readers requires additional assessment. These kinds of information could be most useful to educators in sequencing materials presented during the readiness stage of reading to afford children optimal learning conditions.

Finally, the implications of this study are manifold in terms of selection of visual stimuli for assessment and training of reading skills. The present readiness materials stress discrimination of pictorial and abstract forms which this study suggest are less effective in predicting reading proficiency than are those forms actually involved in the reading act, namely letters and word-units. Furthermore, although reading re.uires additional abilities to the visual perceptual processes, the data indicate that various visual perceptual inefficiencies may increase difficulty in acquiring appropriate reading skills. Thus, it appears imperative that visual perceptual inadequacies are assessed and attended to during the early stages of schooling prior to the development of more serious accumulative effects of the initial problem.